Arab. J. Math.
https://doi.org/10.1007/s40065-018-0209-5

Arabian Journal of Mathematics

S. A. Iyase

On a third-order boundary value problem at resonance on the half-line

Received: 13 June 2017 / Accepted: 21 May 2018

Abstract In this paper, we establish existence of solutions for the following boundary value problem on the half-line: $(q(t)u''(t))' = g(t, u(t), u'(t), u''(t)), \quad t \in (0, \infty)$ subject to the boundary conditions $u'(0) = \sum_{i=1}^{m} \alpha_i \int_0^{\xi_i} u(t)\mathrm{d}t, u(0) = 0, \ \lim_{t\to\infty} q(t)u''(t) = 0$. We establish sufficient conditions for the existence of at least one solution using coincidence degree arguments. An example is provided to validate our result.

Mathematics Subject Classification 34B10 · 34B15 · 34B45

الملخص

في هذا البحث نثبت وجود حلول للمسألة الحدية التالية في نصف مستقيم:

$$\big(q(t)u''(t)\big)' = g\big(t, u(t), u'(t), u''(t)\big), \ \ t \in (0, \infty)$$

تحت الشروط الحدية:

$$u'(0) = \sum_{i=1}^{m} \alpha_i \int_0^{\xi_i} u(t)dt, u(0) = 0, \lim_{t\to\infty} q(t)u''(t) = 0.$$

نقدم بعض شروط الكفاية لوجود حل واحد على الأقل مستخدمين حجّة تطابق الدرجات.

1 Introduction

In this paper, we derive sufficient conditions for the existence of solutions for the following boundary value problem on the half-line

$$(q(t)u''(t))' = g(t, u(t), u'(t), u''(t)), \quad t \in [0, \infty) \tag{1.1}$$

$$u'(0) = \sum_{i=1}^{m} \alpha_i \int_0^{\xi_i} u(t)\mathrm{d}t, u(0) = 0, \ \lim_{t\to\infty} q(t)u''(t) = 0 \tag{1.2}$$

S. A. Iyase (✉)
Department of Mathematics, Covenant University Ota, P.M.B 1023 Ota, Ogun State, Nigeria
E-mail: samuel.iyase@covenantuniversity.edu.ng; driyase2011@yahoo.com

Published online: 12 June 2018